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THE PHILIPPINE JOURNAL OF SCIENCE

PAUL C. FREER, M. D., PH. D.
GENERAL EDITOR

SECTION D

GENERAL BIOLOGY, ETHNOLOGY AND ANTHROPOLOGY

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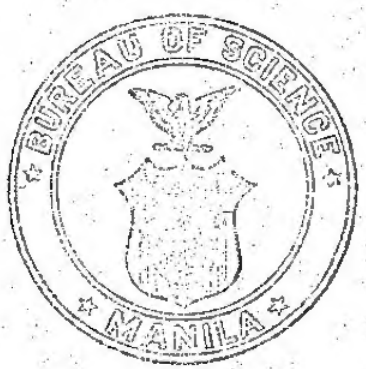

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PUBLICATIONS FOR SALE BY THE BUREAU OF SCIENCE, MANILA, PHILIPPINE ISLANDS

REPORT OF THE INTERNATIONAL PLAGUE CONFERENCE.

Held at Mukden, April, 1911, under the auspices of the Chinese Government.

Edited by Ernst Martini, G. F. Petrie, Arthur Stanley, and Richard P. Strong.

433 pages, 25 plates (2 colored, 4 half-tones, 12 charts and maps).

Order No. 416. Cloth, $3.50; paper, $2.50 United States currency, postpaid.

The proceedings of this International Conference and information gained therefrom, together with the results of certain bacteriological investigations, constitute the present report.

Nothing hitherto has been published which gives such a complete and comprehensive account of the entire subject of pneumonic plague.

Delegates from America (United States of), Austria-Hungary, France, Germany, Great Britain, Italy, Japan, Mexico, the Netherlands, Russia, and China attended the Conference.

The Bureau of Science of the Government of the Philippine Islands has been appointed sale agent for the distribution of the printed proceedings of the International Plague Conference.

THE SUGAR INDUSTRY IN THE ISLAND OF NEGROS.

By Herbert S. Walker.

143 pages, 10 plates, 1 map.

Order No. 412. Paper, $1.25 United States currency, postpaid.

Considered from the viewpoint of practical utility, Mr. Walker's Sugar Industry in the Island of Negros is one of the most important papers published by the Bureau of Science. This volume is a real contribution to the subject; it is not a mere compilation, for the author was in the field and understands the conditions of which he writes. The following is a brief synopsis of the contents:

Tables of soil analyses, both chemical and physical; analyses of the cane, juice and bagasse; estimates based on actual information as to the costs of production and of cultivation; and estimates of the cost and location of possible central factories. The island is considered by sugar-producing districts; the area of cultivation and the production per hectare are given, and the possibility for future expansion discussed.

The plates illustrate various phases of sugar industry from the cultivation of the field to the transportation of sugar in native sailboats.

A MANUAL OF PHILIPPINE SILK CULTURE.

By Charles S. Banks.

53 pages, 20 plates.

Order No. 413. Paper, $0.75 United States currency, postpaid.

The silk industry is particularly adapted to be undertaken by persons with small capital, and like the making of hats in the Philippine Islands it should thrive with a little encouragement.

In A Manual of Philippine Silk Culture we have presented the results of several years' actual work with silk-producing larvæ together with a description of the new Philippine race. Half-tone plates illustrate in natural size silkworms in different stages of development, pupæ, adult moths, samples of cloth made from eri silk, hand reel, and silk house. Other plates illustrate the various appliances used in raising silkworms and in spinning silk; hand and power reels are illustrated; working drawings are given for a silk house and for a hand reel.

Paul C. Freer

OBITUARY

Paul Caspar Freer

DIRECTOR OF THE BUREAU OF SCIENCE OF THE GOVERNMENT OF THE PHILIPPINE ISLANDS
DEAN OF THE COLLEGE OF MEDICINE AND SURGERY AND PROFESSOR OF
CHEMISTRY OF THE UNIVERSITY OF THE PHILIPPINES, AND
FOUNDER AND EDITOR-IN-CHIEF OF THIS JOURNAL

We are deeply grieved to announce the death of Doctor Freer at Baguio, Philippine Islands, on April the seventeenth, in his fifty-first year, from arterio-sclerosis and acute nephritis.

In an effort formally to express our sorrow and to honor his memory a memorial meeting of the members of the Staff of the Bureau of Science, the Council of the University of the Philippines, and the members of the Philippine Islands Medical Association will be held on July 1, 1912. The proceedings of this memorial meeting will be published in a future number of this Journal.

At a meeting of the members of the Staff of the Bureau of Science, held on the eighteenth day of April, the following resolutions were adopted:

Whereas it has pleased Almighty God in His Wise and Inscrutable Providence to remove from our midst Paul Caspar Freer, M. D., Ph. D., Director of the Bureau of Science of the Government of the Philippine Islands, since the time of its organization as the Bureau of Government Laboratories in the year 1901, Dean of the College of Medicine and Surgery, and Professor of Chemistry, University of the Philippines, and Founder and Editor-in-Chief of the "Philippine Journal of Science," who, for many years, has been our Leader, Counselor, and Friend; and

Whereas at best we can do little to indicate at this time our real appreciation of him as a man and as a worker for the general good: Therefore be it

Resolved, That we, the Members of the Staff of the Bureau of Science in Manila, Philippine Islands, do hereby express our deepest sorrow and keen feeling of personal loss in the death of Doctor Freer; and be it further

Resolved, That he holds a place of highest respect, admiration and appreciation both officially and personally in the hearts of all of us, and especially of those who were most intimately associated with him in scientific work; and be it further

Resolved, That it is the sense of the Members of this Institution that the Bureau of Science has suffered a very great loss and that the cause of Science in these Islands has been deprived of one of its most zealous and conscientious advocates; and be it further

Resolved, That we extend our sincere sympathy and condolence to his Widow in her overwhelming grief, to his Sister, Brother and other Relatives; and be it further

Resolved, That copies of these resolutions be engrossed and sent to the bereaved Widow and Brother of Doctor Freer, and that they be filed in the Archives of the Bureau of Science, transmitted to the Bureau of Civil Service, published in the forthcoming Number of each Section of the "Philippine Journal of Science," in the newspapers of Manila, in a paper in the City of Chicago, Doctor Freer's birth-place, and in "Science," the Official Organ of the American Association for the Advancement of Science, of which Doctor Freer was a Fellow.

For the Staff of the Bureau of Science:

[L. S.]

RICHARD P. STRONG,
CHARLES S. BANKS,
E. D. MERRILL,
ALVIN J. COX,
OSCAR TEAGUE,
A. E. SOUTHARD,
Committee.

At Manila, Philippine Islands, this eighteenth day of April, in the year of our Lord one thousand nine hundred and twelve.

THE PHILIPPINE
JOURNAL OF SCIENCE
D. GENERAL BIOLOGY, ETHNOLOGY AND ANTHROPOLOGY

VOL. VII APRIL, 1912 No. 2

THE ANATOMY OF ACLESIA FREERI NEW SPECIES.

By LAWRENCE EDMONDS GRIFFIN.[1]
(From the Zoölogical Laboratory, University of the Philippines.)

DIAGNOSIS.

Body from 13 to 20 centimeters long, not contracted behind the head, sloping upward to the inhalent siphon, descending abruptly behind; entirely covered with simple and compound dermal processes, the largest of which may be 5 centimeters long, a large dermal process between the eyes; another is usually found between the tentacles. Foot extending to posterior extremity of body, sharply pointed behind, broader than body. Ground-color, light gray, overlaid with yellow dots and black markings so that the general effect is olive-green.

Two or three rows of large peacock-blue spots, each surrounded by a narrow brown line, extend along the back and sides of the body. Anterior end of branchial fissure a little in front of the middle of the body. Tentacles large, 25 to 30 millimeters long; rhinophores more slender and tapering, almost as long as the tentacles. Apparently this is the largest described member of the genus.

[1] Associate professor of zoölogy, University of the Philippines.

and all adults; while the character of the body wall is such that the internal organs are completely exposed by a few cuts with the scissors. By using a hypodermic injection of cocaine and atropine the animals can be killed fully extended. They are well preserved by either alcohol or formalin. It has been found, however, that the albumen gland must be well hardened, or it will swell and break down into a gelatinous substance. The dissection of aclesia is not without its difficulties, but this aclesia is, in the opinion of the author, the best gasteropod form for general class work with which he is acquainted.

When crawling upon the bottom, even in clear shallow water, these mollusks are not conspicuous, although easily distinguished and followed when once found by the eye. Their colors blend well with the sandy bottom, rendering them much less conspicuous objects than one would think from observing the animals in an aquarium, where color and form show to the greatest advantage. There is considerable variation in size among the specimens collected, but the average is about 15 centimeters long, 7 centimeters wide, and 5 centimeters high. The posterior extremity extends some distance back of the visceral mass, forming a broad, pointed tail. The creeping sole extends to the tip of this part. The sides of the foot extend beyond the margins of the body.

The highest point of the body is at the level of the anterior end of the branchial fissure. The slope from here to the head is even and gradual, but abrupt and steep to the tail.

The dorsal surface of the head and neck is considerably flattened. The head is distinctly separated from the foot (fig. 10, Plate III), but there is no dorsal or lateral demarcation between the head and the broad, thick, neck region. The lips, which inclose the large ventral mouth, are white in color, thick, and creased. They form a flattened area of considerable extent which is applied to the surface on which the animal is creeping. At each side of the mouth, the head is produced into a pair of large oral lobes, almost directly beneath the tentacles. The ventral edge of the oral lobe is formed by an extension of the lip. The tentacles arise from the latero-anterior angles of the head; they are long and large, tapering little from base to tip. The auriculate tip is directed somewhat posteriorly, and extends in the form of a small fissure down the posterior surface of the tentacle about two-fifths of its length. When the aclesias move about, the flattened surface of the tentacle is spread on the bottom like the palm of a hand. The rhinophores are about as long as

HABITS AND EXTERNAL CHARACTERS.

My attention was called to the presence of this species in Manila Bay by Mr. Dean C. Worcester, about February 1, 1909. The animals were then congregated in enormous numbers for miles along the coast, just below low tide level. At the spot where they were first discovered, there were areas where the animals were so numerous that it was impossible to move without treading on them, and the outstretched hand would cover three or four almost everywhere it could be placed. The aclesias were then engaged in depositing their eggs which are produced in enormous numbers. The egg capsules are inclosed in a cord of greenish mucus, one of which when unraveled proved to be 27 meters in length. The tangled egg-masses are attached, if possible, to stakes or stones; sometimes one animal after another deposits its eggs at the same place, until there is an accumulation sufficient to fill a large pail. An immense number of the egg masses which are deposited on the bottom are washed ashore, forming a windrow which extends along the beach for miles. As the eggs develop, the color of the mass changes to light brown. The egg masses are eaten by many persons in the form of a salad, dressed with vinegar and olive oil. The aclesias themselves also serve as food to a limited extent, the thick body-wall being cooked and eaten. In the years 1909 and 1910, the aclesias first appeared along the shore of the bay near Manila about the first of February. During the middle of the month, their numbers and egg-laying activities were greatest; then the number of aclesias lessened day by day. Few were left at the end of the month, and after the first week of March it was impossible to find any of them along the beach.

The first individual and eggs of the next season were found December 4, 1910; the principal activity in egg-laying occurred during January, 1911, instead of in February as in the previous years. Many aclesias, however, remained along the shore until the last week of February. Other duties rendered it impossible to determine the extent of coast line along which the aclesias appeared during the years mentioned.

The author has found this aclesia to be an extremely useful form to use in his classes. The supply appears to be regular and unlimited.[1]

The animals are of large size, clean in appearance and odor,

[1] In 1912 no aclesias had appeared by March 11, the date on which the author left Manila.

and all adults; while the character of the body wall is such that the internal organs are completely exposed by a few cuts with the scissors. By using a hypodermic injection of cocaine and atropine the animals can be killed fully extended. They are well preserved by either alcohol or formalin. It has been found, however, that the albumen gland must be well hardened, or it will swell and break down into a gelatinous substance. The dissection of aclesia is not without its difficulties, but this aclesia is, in the opinion of the author, the best gasteropod form for general class work with which he is acquainted.

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the tentacles, but more tapering. Their fissures extend from base to tip of the posterior side; except at the tip, the margins of the fissure are usually rolled tightly upon each other. When the rhinophores are fully extended their bases meet in the midline to a height of 6 to 10 millimeters above the surface of the head, making them appear to spring from a transverse elevation of the head. When retracted, they appear to be widely separated. The bases of the tentacles do not approach each other closely, even when most fully extended.

The eyes lie on the line connecting the centers of the bases of the tentacle and rhinophore, slightly nearer the rhinophore than the tentacle. In life, the minute, black eye is surrounded by a narrow ring of bright yellow, which renders the eyes fairly conspicuous. After preservation, the color about the eyes fades, and the eyes seem to become somewhat depressed by the contraction of the skin so that it becomes difficult to find them.

The entire dorsal and lateral surfaces of the body are covered (excepting only the oral lobes) by slender villi of different sizes; the small ones simple, the larger ones more or less branched. Scattered over the surface of the body are good-sized, conical elevations of the skin, made more distinct by the radial, black lines or spots with which they are marked, and frequently covered with villi. Between the bases of the villi, the skin is covered by numerous, extremely fine, dermal papillæ scarcely distinguishable without a hand lens, and only to be observed in well expanded, living animals. Some specimens are found in which practically all the villi are short and simple. In others, the villi are fewer in number, long, and complexly branched. Even the tentacles and rhinophores may carry large compound villi. The number of branches possessed by a large villus can only be determined when it is fully expanded, for the contractility of these processes is so great that a large and highly complex villus when contracted may appear as a tubercle on the surface of the body from which project only one to three small simple villi. A curious feature of the villi, both large and small, is the presence of ridges, or angles, extending from base to tip. There are always two, and frequently three, of these. Branches, or secondary papillæ, always arise from these ridges. A large papilla, which arises from the middle of the dorsum of the head, about equidistant between the tentacles and rhinophores, appears to be a constant feature. When fully extended, it is of about the same size as these other organs, and appears much like an extra tentacle. Preserved specimens

show scarcely a trace of it. Another large papilla may arise from the anterior edge of the head between the tentacles, but does not appear to be so constant in its development as the one previously mentioned.

The tissues of the body wall and foot are delicate and translucent; this character combined with the pleasing coloration render *Aclesia freeri* a much handsomer animal than most large tectibranchs. Viewed with the naked eye, the ground-color appears to be olive, but under a lens it is seen to be a very light gray. Black dots and lines are so closely placed upon this that the ground-color in most places is reduced to small irregular dots, not distinguishable without a hand lens. The sole of the foot is lighter in color than the body because the overlying color is light brown, and its markings are much finer and more evenly distributed than those of the body.

The tips of the minute papillæ, which have been mentioned previously, are white, and thus a finely regular, whitish speckling of the skin is produced.

About and on the bases of the larger villi, the black markings have the form of complete or incomplete rings, crescents, and irregular flecks of vivid black. Between the bases of the villi are numerous irregular areas where the black markings unite, producing a fine black network inclosing minute gray areas and the small white-tipped papillæ previously referred to. The black markings of the larger papillæ become finer and finer toward the tip; to the naked eye, no black is visible in the terminal portion of the papillæ. The ground color, also, changes from gray to tan, or even reddish-brown, with or without minute dots of canary-yellow. The spots of the last-mentioned color are widely distributed over the body of some specimens and lacking in others.

The brilliant eye-like spots of peacock-blue are subject to extreme variation. In general, two fairly well-defined rows may be distinguished. One row extends along the side of the body, 10 to 20 millimeters above the foot; the other commences back of the tentacle and passes along the back parallel with, and about 1.5 centimeters distant from, the branchial fissure. Sometimes a third row appears, close to the margin of the fissure. The color of these spots is very uniform. When examined with a lens, the blue appears to be flecked with bright spots, appearing like the metallic paints often used on children's toys. The spots are ordinarily fairly uniform in size, and from 3 to 5 millimeters in diameter. Occasionally one finds a specimen

having a number of small blue spots, 1 millimeter or less across, about the bases of the rhinophores. The smallest spots are entirely blue, but the larger and more usual ones have dark centers, marked and colored like the general surface of the body. Each spot is finely margined with black, outside of which is a second equally fine ring of gray to brown.

In certain lights, the foot shows a beautiful violet iridescence, possibly due to the layer of mucus covering it. During life, the gizzard, hermaphrodite gland, and anterior genital mass show through the tissues of the foot. The expanded oral surface, the ventral edges of the oral lobes, and the groove separating the head from the foot are very lightly pigmented.

The parapodial lobes are separated for more than half their length by the branchial fissure, but fused with each other posterior to this (fig. 1, Plate I). At the level of the anterior end of the branchial fissure they are joined to the body wall from the seminal furrow to the margin of the foot (fig. 8, Plate II). A large contractile sac is thus formed which surrounds, but is not attached to, the visceral mass of the body, within which lies the large branchia, and into which open the anus and the renal and reproductive pores. The branchial fissure lies slightly to the right of the median dorsal line. During inspiration, the anterior end of the branchial fissure (inhalent siphon) expands, and its margins are elevated, while the posterior extremity closes. The parapodial sac enlarges so as considerably to increase the space between its wall and the body. When expiration begins, the anterior opening closes suddenly, the posterior (exhalent siphon) opens, and the water inclosed by the parapodial sac is expelled by the contraction of the walls of the sac with considerable force, a force sufficient to carry all refuse well beyond the end of the tail. The anal papilla lies immediately below the exhalent siphon (fig. 8, Plate II). It can be extended so as to bring the anus almost into the exhalent siphon (fig. 9, Plate II) and thus discharge fæcal materials into the outpassing current in such a manner that they will be completely carried away.

The division between the right and left parapodia is maintained anteriorly by the seminal furrow, which passes from the genital orifice over the dorsum and right side (fig. 8, Plate II), to the penial pore, just below the right tentacle.

The body wall, parapodial lobes, and foot are translucent and appear to be composed largely of a gelatinous connective tissue. There is present, however, a considerable amount of muscle tissue in these parts, and they shrink little in properly preserved speci-

mens. The parapodia are traversed by numerous muscle strands passing from the outer to the inner wall. An irregular network of larger muscle bands lies next to the internal surface, which can be clearly seen when the parapodia are reflected. Outside of the horizontal muscle layer, but close to the internal surface of the parapodium, is a network of venous sinuses which forms a quite definite layer (fig. 8, Plate II).

There being no trace of a shell, the mantle is reduced to a ridge which passes from near the anterior side of the branchial cavity around the left end of the gill, finally ending behind the gill near the base of the anal papilla. The pericardium and nephridium lie to the left of the ridge, raised somewhat above the general level of the floor of the branchial chamber. The highest part of the mantle vestige, near the posterior end, projects from 5 to 7 millimeters, sufficient to enable it to overlie a few small plates of the posterior end of the branchia. The anterior end of the mantle ridge is brillant black, and is composed of denser tissue than the remander of the ridge. The posterior extremity of the mantle ridge is also pigmented.

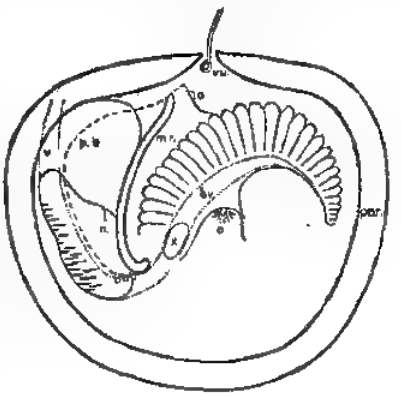

FIG. 1.—Diagram of the pallial complex of *Aclesia freeri* sp. nov.: *a*, anal papilla; *bv*, afferent branchial vein; *mr*, mantle ridge, i. e., the projecting free margin of the reduced mantle; *n*, nephridium; *o*, osphradium; *par*, parapodium; *p*, *e*, pericardium; *v*, vein of left side of body running beneath the pericardium and nephridium; *vu*, vulva; *x*, aperture by which the blood from the haemocœl and veins of the right side of the body enters the branchial vein.

These aclesias have the power, possessed by most tectibranchs, of emitting a purple dye when they are greatly disturbed by handling, or when the water in which they are kept becomes unbearably stale.

The dye is emitted by this species in smaller quantity and with more reluctance than by any other aplysiid with which I am familiar. The great majority of the specimens which have been killed, either by asphyxiation or by narcotization, have died without giving forth any trace of dye.

The dye is produced from the pigmented areas at the anterior and posterior ends of the mantle ridge, the anterior region producing the greater amount. The pigmented areas of the mantle ridge can be squeezed in a moribund aclesia, when the purple dye

will issue from the skin; at the same time the pigmentation disappears. The black pigment of these spots can all be pressed out, coloring the water purple as it appears, until the skin is white.

The renal pore is located in the pigmented area at the posterior extremity of the mantle ridge.

The true mantle cavity extends farther beneath the base of the gill than is at first apparent. The dotted line in text figure 1 indicates the limit of the mantle cavity. From this it will be seen that a considerable part of the pericardium and of the nephridium is included in the base of the mantle.

The branchia is large (65 millimeters long, 25 millimeters wide, and 15 millimeters thick). It is attached to the mantle and body wall by a broad base which follows approximately the curve of the mantle ridge. The free extremity of the branchia curves to the right and backward, ending well back of the anal papilla. Both dorsal and ventral sides of the branchia are subdivided into leaflets, upon the outer edges of which the afferent branchial veins are prominent. The dorsal and ventral series of leaflets are widely separated by a deep groove on the anterior face of the branchia. The color of the branchia is gray or greenish, punctate with numerous black dots.

The anal papilla stands just below the exhalent siphon and within the arc of the posterior side of the gill. Within the inspiratory aperture and a little to the right is the opening of the vulva. The thin-walled pericardium occupies the area on the left side of the body between the mantle ridge and the anterior margin of the branchial chamber. The triangular nephridium forms the posterior border of the pericardium, and extends backward as far as the posterior extremity of the mantle (fig. 8, Plate II). The visceral mass back of and below the kidney is covered by a thin, semitransparent body wall, which is pigmented in extremely fine black dots. The outlines of the liver and hermaphrodite gland, and portions of two coils of the intestine can be seen through the kidney and pericardium.

On the right side of the branchial chamber, we find beneath the branchia and in front of the anus, an elevation caused by a portion of the reproductive system (the "anterior genital mass").

The hypobranchial gland consists of an area of dermal glands which lie in the floor of the branchial cavity, commencing at the right side of the genital orifice, and extending backward along the right side at least as far as the level of the anal papilla. The thickening of the dermis in the glandular area is noticeable;

the color there is lighter than on the surrounding parts. The gland appears to secrete large quantities of mucus, but no dye seems to be produced there, nor does the secretion have a disagreeable odor, as in some other aplysiids.

INTERNAL ANATOMY.

The osphradium lies in the angle under the extreme anterior end of the base of the branchia (text figure 1). It has the form of an oval papilla, only slightly raised above the surrounding surface; it is depressed a little at the center, where the osphradial ganglion is in contact with the dermis.

The pericardium is thin-walled and occupies the space between the mantle rim and the anterior wall of the respiratory chamber. It is bounded posteriorly and overlapped by the nephridium, which is light-colored and somewhat elevated. The lateral (left) border of the kidney is approximately parallel to the mantle rim, although in most cases the posterior end of the kidney is much narrower than the anterior. The external aperture of the kidney, the reno-branchial pore, is found on a thickened and pigmented area at the posterior extremity of the mantle rim, to the left of the base of the anal papilla. The anterior and lateral portions of the nephridium are composed of solid glandular substance. The postero-median region contains but little glandular tissue, which lines the walls, while the central part is occupied by a more or less distinct cavity. The lateral edge of the nephridium lies over the large vein which collects blood from the left side of the body. Numerous minute openings are visible in the surface of the nephridium which lies against the vein. The pericardium and nephridium lap to such an extent that nearly one-half of the latter overlies the pericardium. The reno-pericardial pore is formed at the extreme posterior end of the pericardium, close to the angle formed by the dorsal, posterior, and median walls.

Veins from the nephridium open directly into the left side of the auricle.

ALIMENTARY SYSTEM.

The narrow, slit-like mouth lies in the middle of a nearly circular, flat, oral plate, the thickened skin of which is raised in radiating, pleated ridges (fig. 10, Plate III). The flattened, free edges of the ridges are white, while the grooves between them are flecked with black spots. The ventral edges of the oral lobes are continuous with the surface of the oral plate. Just within the lips, each side of the buccal cavity is armed by a

flat, horny, mandibular plate, of the shape shown by text figure 2. Each plate is composed of fine rodlets, which are inclined to the surface in such a way that they overlap each other, leaving only the heavy, bluntly-pointed ends projecting and pointing toward the concave anterior border.

The pharynx (buccal mass) is large and muscular, the intrinsic circular and longitudinal muscles, as well as its retractors and protractors, being well developed and defined (fig. 15, Plate III). The tongue is large and firm, is quite regularly ovoid in shape, and occupies most of the floor of the pharynx (fig. 13, Plate III). The anterior surface presents a median point, from which a frenum-like ridge extends along the floor of the pharynx to the mouth; the posterior end of the tongue overhangs the base. The radula is light brown, broad, depressed along the median line, acutely pointed at the anterior end, and rounded posteriorly. The widest part of the radula lies upon the posterior face of the tongue. Absorption of the lateral teeth commences at the posterior limit of the anterior face of the tongue and proceeds inward from this point, resulting in the pointed anterior end of the radula already referred to. The radular sheath lies under the posterior end of the tongue, and is broad and shallow. A transverse arcuated fold of the floor of the pharynx lies behind and parallel to the base of the tongue.

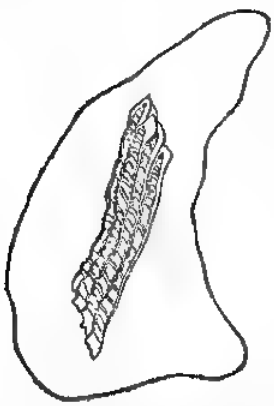

FIG. 2.—Outline of a mandibular plate of *Aclesia freeri* sp. nov. The figure within the outline represents four of the rods of which the plate is composed. The concave border of the plate is anterior. Actual dimensions, 5 millimeters high, 3 millimeters wide at bottom, 1 millimeter wide at top.

On each side a broad fold of mucous membrane projects from the lateral wall of the pharynx above the posterior portion of the tongue. In the unopened pharynx the free medial edges are applied closely to each other, completely separating the anterior, muscular-walled part of the pharyngeal cavity which contains the tongue, from a thin-walled posterior portion which opens directly into the œsophagus. The inner (ventral) surfaces of the folds are fairly smooth, the outer surfaces corrugated. The apertures of the salivary ducts are on the inner surfaces of these folds, near their anterior extremities. The mucous membrane of the pharynx is pigmented in black spots and lines.

The radula sac opens by a V-shaped aperture in the middle of the posterior half of the dorsum of the tongue. The posterior wall of the sac is folded into it, so as to lie against the lateral walls. The sac is deep, extending obliquely downward and forward to the base, and almost to the anterior extremity of the tongue.

The radula (figs. 27, 28, and 29, Plate IV) consists of two portions; one lying upon the dorsal and anterior surface of the tongue, the other bending sharply at right angles to the first portion, and lying on the posterior face of the tongue and in the radula sac. The central part of the exposed portion of the radula is considerably raised above the margins, and at the anterior end forms a high sharp ridge, where the central teeth are apparently the only ones used. The center of the posterior portion of the radula, on the contrary, is greatly depressed.

FIG. 3.—Central tooth, first and second inner laterals, and four outer lateral teeth of the radula of *Aclesia freeri* sp. nov.

The radular teeth are of the type common to the family, and little different from those of other known species of aclesias. Text figure 3 represents the central tooth, the first two lateral teeth, and the four outermost lateral teeth of a row. A detailed description would be superfluous.

The inner surface of the anterior and ventral part of the pharynx is covered by a fairly heavy, chitinous cuticula which bears numerous spines of the kind shown in text figure 4. They are of two kinds; in the anterior region the spines are short, thick, and sharply pointed; posteriorly, there are patches of long, slender, blunt spines which seem to be totally lacking in rigidity, and are more like cuticula-covered villi than spines.

FIG. 4.—Cuticular spines or thorns upon the inner surface of the pharynx of *Aclesia freeri* sp. nov. The four spines at the bottom are from the anterior, the ones above from the posterior region of the part of the pharynx thus armed.

The long (35 to 40 millemters), lobulated, salivary glands lie parallel to the œsophagus (fig. 12, Plate III); their posterior ends are loosely attached to the surface of the gizzard. The ducts of the salivary glands pass under the posterior edge of the outermost circular muscle layer of the pharynx until they reach the dorsal surface of this organ. They then turn forward for a distance of from 3 to 4 millimeters.

beneath the muscular wall, and finally open into the pharyngeal cavity near the anterior ends of the lateral lamellæ, as previously mentioned (page 74).

The œsophagus is a straight tube about 25 millimeters in length. Its mucous membrane is thrown into numerous, straight, longitudinal folds. The œsophagus opens into a thin-walled saccular crop, about 12 millimeters long by 15 millimeters in diameter. The opening of the œsophagus into the crop is guarded by a strong sphincter muscle and, also, by an annular fold of the mucous membrane of the œsophagus, which projects backward into the crop (fig. 13, Plate III). The mucous membrane of the crop is smooth.

The crop is followed by a muscular, barrel-shaped gizzard, 12 millimeters long by 17 millimeters in diameter. The muscular wall of the gizzard consists of a thick, complete ring of circular muscles, thickest at the center and thinning regularly toward each end. The interior of the gizzard is almost completely filled by roughly pyramidal, chitinous "stomach-plates," usually about 10 in number, which occupy the greater part of the wall. A row of from 9 to 11 small plates stands in front of these. The plates have about the same consistency as fresh hyaline cartilage, and are of a light coffee-color. The food of the animal consists of the animal and plant substances which are mixed with the bottom sand, which must be very effectively ground in passing through the narrow passages between these plates. It appears probable that the trituration of the food is accomplished more by the sand grains which are mixed with it than by the direct action of the stomach plates. The arrangement of the latter is such as to leave only tortuous, narrow passages through the gizzard when that organ is relaxed. When its muscular walls contract, the sand grains contained in the passages will be pressed against each other and against any food substances present, producing a comminuting action much more effective than can be attained by the direct action of the large, blunt, and somewhat soft plates. The large stomach plates are bluntly pointed, with the points directed slightly backward. Each plate presents 3 or 4 prominent, somewhat irregular, but not sharp edges (figs. 17 and 18, Plate III). The bases of the plates are slightly convex and, in general, ovoid in outline. The center of the plate is occupied by an axial column of darker color and slightly harder material than the outer part, which is exposed upon the worn tip of the plate.

The plates are composed of numerous, thin layers, parallel to

the base. Each layer consists of prismatic columns, which are superposed, or coincide, from layer to layer. Each plate is situated on an epithelial bed with slightly elevated margins, the shape of which corresponds to the shape of the bottom of the plate. An area is visible in the center which corresponds to the base of the axial column of the plate.

The smaller plates of the anterior row are more slender, and pointed, and are considerably curved toward the interior part of the gizzard (fig. 19, Plate II). It is noticeable that the small stomach-plates are all found on the anterior edge of the gizzard, while the largest plates are found in the posterior row. Among the anterior plates, also, and located on the extreme anterior edge of the gizzard, often may be found minute plates in the first stages of growth. This arrangement suggests that possibly new teeth are continually being produced at the anterior edge of the gizzard, which gradually move backward as they grow, room being made for them by the reabsorption, or falling away, of the most posterior plates. Such a process would be essentially similar to the forward movement of the bands along which the nautilus is attached to its shell as its body moves forward in the growing shell.

The axial column is the first part of the plate to be formed, growing from a minute, subtriangular, flat, epithelial elevation at the anterior edge of the gizzard. The outer coating is then formed around this, almost entirely, at first, upon the posterior side, where it frequently develops in a second point. The axial column is the more sharply pointed of the two; its tip is not covered by the secondary deposit until the plate is of considerable size. A second axial column develops just in front of the first, fused with the first at its base, but with freely projecting tip. With further growth of the plate, the axial column now develops as a single structure, while the double point becomes worn away. The outer substance is formed in considerable thickness upon the anterior surface of the axial column, while it remains as a thin layer upon the sides. As a result of this method of deposition, the axial column usually extends almost completely across the plate and forms the entire grinding surface, and the outer substance forms considerable masses anterior and posterior to the axial column (figs. 17 and 19, Plate III). The surfaces of the axial column are iridescent.

The elongated conical stomach, which follows the gizzard, shows no definite demarcation from the intestine. It is about 35 millimeters in length, and curves to the right under the

liver. The hepatic duct opens into the stomach by a large aperture on the dorsal side (fig. 21, Plate IV). Projecting from the inner surface of the stomach are numerous, slender, sharp-pointed spines of the same composition and structure as the plates of the gizzard, and arranged in a definite and constant manner (fig. 13, Plate III). They pass in two rows completely around the stomach, the first row being close to, and paralled with, the posterior margin of the gizzard. The plane of the second ring is perpendicular to the axis of the stomach. Therefore, it lies about 5 millimeters behind the first ring on the dorsal side of the stomach, but 15 millimeters behind it ventrally. Where the rows approach each other dorsad, they are connected by a short broad band of similar spines. The bands of epithelium on which the spines stand appear to be somewhat modified, being slightly lighter in color and smoother than the remainder of the stomach epithelium. The aperture of the hepatic duct lies directly behind the median dorsal band of spines. It is large, but is guarded by what appears to be an efficient, although peculiar, device (figs. 13 and 14, Plate III). At the anterior edge of the aperture stands a large conical stomach plate, which is inclined backward over the aperture. As this plate stands close to the posterior end of the short dorsal band of spines, it may possibly be considered as the hindmost and most developed one of the same series. It differs from plates of similar size in the gizzard in presenting no angles, its base being oval in outline. To the right and left of the aperture is a pair of prominent pad-like structures with much-folded mucous membrane. The meeting of the two pads and the anterior plate effectually closes the aperture of the hepatic duct.

The pylorus is constricted by a weak sphincter muscle. The character of the mucous membrane does not change at the pylorus, but appears to be the same in the upper part of the intestine as in the stomach. The long intestine traverses the length of the liver three times, beside coiling around it, and making a double loop over the surface of the hermaphrodite gland (fig. 12, Plate III). Within 15 millimeters of the anus, a sudden change occurs in the nature of the mucous membrane, which there becomes thicker and is thrown into from 10 to 12 longitudinal folds. Each fold corresponds to one of the points on the edge of the anal papilla. The rectum occupies the center of the anal papilla; around it is a considerable thickness of gauzy connective tissue, crossed by numerous radiating fibers connecting the rectum and the dermis.

The liver needs no particular description. It forms a solid, well-defined mass, without division into distinct lobes. The intestine is so closely attached to the liver in most places that it can not be dissected away without rupture. The life-color of the liver is gray with black markings, but after preservation in formalin the liver assumes the usual dark-green color.

The hepatic ducts form three main ducts, one anterior and two posterior, which open into a short but broad common duct (fig. 21, Plate IV). The latter receives a few small ducts which are independent of the three larger ducts already mentioned. The common hepatic duct opens into the stomach by the aperture previously described.

The right stomatogastric nerve (fig. 21, Plate IV) passes to the dorsal side of the œsophagus, while the left remains ventral. Near the posterior end of the crop these nerves divide into branches which make a ring around the crop and anterior end of the gizzard, and also give off three nerves which pass over the surface of the gizzard, one on the dorsal, one on the ventral, and one on the left side. At the anterior end and near the middle of the stomach these three nerves anastomose in two rings which encircle the stomach. From the second ring, the left and ventral branches proceed to the pylorus, where another ring is formed. From this point, nerves pass along the walls of the intestine, but can not be readily followed. No noticeable enlargements or ganglia occur at the points of anastomosis.

VASCULAR SYSTEM.

The auricle (fig. 31, Plate V) is large (23 millimeters wide, 9 millimeters long, 7 millimeters deep), its base being expanded so that it covers the base of the gill and extends upon the anterior face of the kidney. The reno-pericardial pore is found beneath this part of the auricle. The wall of the auricle is transparent and extremely delicate. Its interior is crossed by numerous anastomosing muscular fibers, which can be seen through the wall. The auricle receives blood through several large openings from the efferent branchial vein, as well as by one or more openings from the kidney. The ventricle (fig. 31, Plate V) is conical (14 millimeters long by 11 millimeters wide), the base being turned toward the auricle, with thick but spongy walls. The auricle is attached to the ventricle over practically the entire basal surface. The auriculo-ventricular aperture is a wide horizontal slit, 6 millimeters long. Each lip of the slit is turned into the ventricle and forms an efficient semilunar valve, 4 millimeters high (fig. 32, Plate V).

The pointed anterior end of the ventricle joins a bulbous aorta of considerable size, a large appendage of which projects upon the right side. Four large arteries spring from the aortic bulb, the intestinal, gastric, and genital arteries, and the aorta.

The gastric artery (fig. 30, Plate V, 22) quickly divides into two branches which follow the junction of crop and gizzard, one on the dorsal and left sides, the other on the right and ventral surfaces. Each gives off branches to both gizzard and crop. The right branch sends a large vessel to the œsophagus. The aorta (fig. 30, Plate V, 5) passes forward and downward over the left side of the viscera until it reaches a position beneath the posterior extremity of the pharynx. Here, a large vessel is sent forward beneath the pharynx until the anterior portion of this is reached, where the vessel enters the pharynx. This vessel sends a small branch from its right side to the pleuropedal ganglion; from the left side a larger branch supplies the ventral and dorsal walls of the head and the cerebral ganglia; a ventral branch passes into the foot.

In one specimen dissected, a large branch arose from each side of the base of the pharyngeal artery (fig. 30, Plate V), at the point where it passes beneath the pedal ganglia. The right branch entered the sheath of the right side of the nerve ring, the left one the left side. The diameter of each branch being fully half that of the pharyngeal artery, it may be seen that the central nervous system is richly supplied with blood.

The aorta then turns backward along the left side of the foot, sending first a large branch into the middle portion of the foot, then passing into the tissues at the junction of foot and lateral body wall back of the middle of the body.

The intestinal artery (fig. 30, Plate V, 19) arises from the posterior part of the aortic bulb, passes immediately into the liver, and then follows closely the second, posteriorly-directed loop of the intestine. One large branch passes through the anterior part of the liver to the part of the intestine just back of the gizzard (fig. 30, Plate V, 23); other branches pass into the substance of the liver; numerous short branches are given off to the intestinal walls. The genital artery (fig. 30, Plate V, 12) gives off, first, a branch which furnishes a rich supply of blood to the terminal part of the sperm-oviduct and to the neighboring body wall, and a branch to the osphradium. The main vessel passes downward, following closely the medial side of the genital duct; it then divides, one part passing above the duct to the right side of the albumen gland, the other branch passing to the ventral side

of the genital mass, giving off a branch to the hermaphrodite duct, a large vessel to the posterior and right sides of the albumen gland, another vessel to the anterior part of this gland, and a vessel to the central mucous gland.

The principal vein of the body lies under the left margin of the nephridium and pericardium, occupying the entire width of the space which separates the lateral extension of the true mantle-cavity beneath the nephridium and pericardium, from the body wall of the left side of the visceral mass. Numerous apertures in the ventral surface of this vein admit blood from the left side of the body. Other openings in the dorsal wall permit blood to pass from it into the kidney. At the base of the branchia, it receives a large vein from the right side of the visceral mass, and then enters the efferent branchial vein. The efferent branchial vein opens into the auricle by several large apertures. The venous sinuses of the nephridium, also, communicate directly with the auricle.

REPRODUCTIVE SYSTEM.

The principal portions of the reproductive system (fig. 23, Plate IV) form two large masses, often referred to in the literature of this group of mollusks as the anterior and posterior genital masses. The posterior mass consists entirely of the hermaphrodite gland, which lies back of the liver and forms the rounded posterior extremity of the visceral mass. The hermaphrodite gland, in reality, is an elongated organ, but is rolled spirally in such a manner as to form an approximately hemispherical mass, the flattened surface of which is applied against the liver. The coils of the intestine which enfold the gland follow its inrolled edges. The convoluted hermaphrodite duct arises from near the center of the anterior surface of the gland, and passing toward the right side connects with the ventral surface of the anterior genital mass (fig. 22, Plate IV). The anterior genital mass is composed of a central mucous (nidamental) gland, surrounded by the coils of the oviduct (fig. 22, Plate IV). Upon its ventral surface is the spermatocyst. The hermaphrodite duct passes forward under the anterior genital mass till it reaches the neck of the spermatocyst. The last coil of the oviduct is continuous with the sperm-oviduct which passes forward from the right side of the mass (text figure 5). The spermatocyst opens into the smaller spermatic division of the sperm-oviduct. At the base of the spermatocyst, the hermaphrodite duct changes its character, becoming much

smaller and losing its convolutions. This narrow portion of the duct passes almost completely around the neck of the spermatocyst, until directly posterior to it (fig. 22, Plate IV). Here, the hermaphrodite duct divides into two portions, sperm duct and oviduct. The sperm duct turns sharply forward, crosses the neck of the spermatocyst, and finally enters the latter upon its anterior surface close to the junction of the spermatocyst with the sperm-oviduct (text figure 5). The oviduct passes dorsad over the posterior surface of the neck of the mucous gland and leads directly into the convoluted tube seen on the dorsal side of the anterior genital mass (fig. 23, Plate IV). This can then be traced into the broad white coils which form the structure commonly called the albumen gland, which as a matter of fact is no more than a specialized portion of the oviduct. The albuminogenous portion of the oviduct is flattened transversely, the lumen being a horizontal slit which extends almost completely across the tube. The wall of the outer edge of the duct remains thin, forming a well-marked conducting channel. The dorsal and ventral walls of the glandular part of the dupt are produced internally into thin, closely packed, transverse lamellæ, to which the considerable apparent thickness of these walls is due. The proximal end of the albuminogenous portion of the oviduct is thin-walled and differs conspicuously from the remaining portions by the racemose condition of its wall. The wall of this part, moreover, is quite thin and bears no internal lamellæ. The oviduct finally opens into the right, or oviducal, side of the sperm-oviduct (text figure 5).

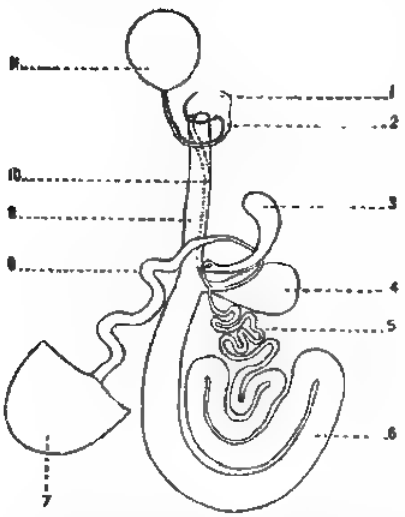

FIG. 5.—Diagram of the reproductive system of *Aclesia freeri* sp. nov. 1, vulva; 2, copulatory recess; 3, spermatocyst; 4, mucous gland (nidamental gland); 5, proximal portion of oviduct; 6, albuminogenous portion of oviduct (albumen gland); 7, hermaphrodite gland; 8, hermaphrodite duct; 9, ovarian portion of sperm-oviduct; 10, spermatic portion of sperm-oviduct; 11, spermatheca.

The mucous (nidamental) gland is visible only on the ventral surface of the anterior genital mass. It is a brown body, roughly triangular in outline, occupying the central part of the

mass (fig. 22, Plate IV). Its walls are thinner, but considerably firmer and stronger, than those of the albumen gland. The internal cavity of the gland is large; it is partially divided into an anterior and a posterior chamber by an inward projection of the dorsal wall. The internal surfaces of the walls are folded into low lamellæ, which are approximately parallel to the axis of the gland. The broad, short neck of the gland opens by a large aperture into the ovarian side of the sperm-oviduct, just back of the junction of the spermatocyst with the spermatic duct (text figure 5).

The spermatocyst is a club-shaped sack, the narrow neck of which is a direct continuation of the spermatic portion of the sperm-oviduct (fig. 22, Plate IV; text figure 5).

The common genital duct (sperm-oviduct) is divided into two parallel tubes by a pair of longitudinal, internal folds arising from the walls, whose edges are closely appressed. The oviducal portion is thicker-walled than the spermatic, the walls being evidently glandular. Near the vulva, the sperm-oviduct is twisted spirally. Two or more complete turns are made; the spermatic portion of the duct thus comes to open into the vulva upon the left side of the ovarian. There is a single genital opening into the vulva, but the spermatic and ovarian apertures are practically separated by the median septa previously mentioned. The seminal furrow enters the spermatic duct, and can be traced along its wall nearly to the proximal end.

The globular spermatheca (Vesicle of Swammerdam) lies in front and to the left of the genital aperture (fig. 23, Plate IV). Its slender duct passes backward and along the left side of the vulva, crosses over the sperm-oviduct to the right side, and turning forward enters a small diverticulum of the vulva upon the right side.

The penial aperture is found immediately under the right tentacle. When the penis is indrawn, it lies in its sheath at the right side of the pharynx. There is no prostate gland connected with the organ. When extended the penis has the form of a cylinder about 5 millimeters in diameter by from 14 to 18 millimeters long, terminating in a flattened expansion, the prepuce (figs. 24 and 25, Plate IV). The cylindrical base is pigmented like the surrounding skin; the prepuce is white. The main flattened portion of the prepuce is about 9 by 7 millimeters in dimensions, nonmuscular, and apparently capable of being considerably distended by vascularization. The distal

surface is slightly convex, and is marked by fine parallel ridges. The anterior angle is produced into a sharp, slightly spiral point, from 4 to 6 millimeters in length, over which are scattered small backwardly directed spines. Upon reaching the base of the penis, the seminal furrow passes distally upon the anterior surface of the cylindrical base of the organ and then follows a somewhat spiral course to the tip of the prepuce.

A shelf-like lamella springing from the right side of the seminal furrow, which meets the overhanging margin of the left side of the furrow, practically forms a closed tube along the bottom of the seminal furrow for the passage of sperm from the genital oriface to the copulatory organ.

NERVOUS SYSTEM.

The circumœsophageal ring formed by the central nervous system is large and but loosely attached to the œsophagus. It is enveloped by an extremely fine, cottony form of connective tissue; the connective tissue unites those nerves which pass most directly from the cerebral, pleural, and pedal ganglia to the body wall, and thus a small space surrounding the pharynx is almost completely separated from the large body hæmocœl. The various ganglia are large, but not all distinct without careful dissection because of their close fusion. Ganglia and nerves are covered by thick connective-tissue sheaths. The cerebral ganglia (fig. 33, Plate VI) are fused into a single mass which shows no median constriction or other sign of its double origin. The optic and rhinophoral nerves arise from its dorsal surface; nerves to the other parts of the head spring from the anterior margin. The cerebro-pleural and cerebro-pedal connectives are either separated by a slit, or are so loosely united by connective tissue that they can be easily distinguished. The pleural and pedal ganglia of each side are closely fused. The pedal commissure is large, and a narrow parapedal commissure is also present upon the posterior face of the pedal commissure; these two may be separated by a narrow space toward the right side. The visceral and parietal ganglia are closely fused to each other and to the right pleural ganglion, but are connected to the left pleural ganglion by a long and fairly thick pleuro-visceral connective. The cerebro-buccal connectives arise from the sides of the cerebral ganglia, just in front of the roots of the cerebro-pedal connectives. They make an unusually wide loop around the sides of the œsophagus and join the sides of the buccal ganglia instead of the posterior surfaces, as is more commonly

the case. The buccal ganglia are comparatively large. They give origin to the stomatogastric nerves, as well as to those which pass to the muscles of the buccal mass and to the salivary glands.

Each rhinophoral nerve ends in a small ganglion, lying at the base of the inrolled, sensory surface of the rhinophore, from which a number of fine nerves pass to all parts of the sensory epithelium. There is no apparent tentacular ganglion, the tentacular nerve ending in a network of fine branches under the inrolled surface of the tentacle. The nerve of the oral lobe ends similarly. Several nerves spring from each pleural ganglion and pass to the lateral and dorsal walls of the anterior half of the body. A large nerve from each pedal ganglion passes backward from along the junction of the foot and wall of the body to the end of the tail. Branches pass from it to the parapodia and the posterior half of the foot. Other nerves, arising from the pedal ganglia, innervate the parapodia (fig. 33, Plate VI, 14 and 15) and the anterior half of the foot (37). A small, much-branched nerve passes from the right pedal ganglion to the penis, its muscles, and the body wall in its immediate neighborhood.

A large genital nerve extends from the visceral ganglion to a small genital ganglion. From it some small nerves enter the integument around the vulva, while the principal nerve runs along the sperm-oviduct until it reaches the point where the hermaphrodite duct crosses the oviduct, traversing several small ganglia on the way. At this point is a larger ganglion from which the principal nerves of the albumen and hermaphrodite glands arise.

A much smaller nerve which arises from the left side of the visceral ganglion (fig. 33, Plate VI, 23) runs, without any branches, along the right side of the body to the rectum, where it enters a small rectal ganglion; from this a nerve passes along the rectum toward the intestine. A third nerve, also very fine, arises from the right side of the visceral ganglion (fig. 33, Plate VI, 26), and runs directly backward; this was traced to the duct of the spermatheca and to the pericardial wall. The parietal ganglion gives rise to a single, large nerve which passes to the osphradial ganglion (fig. 33, Plate VI, 27); the branchial nerve arises from this and passes into the base of the gill.

In life, the individual ganglia or groups of nerve cells are vivid orange in color, and a better idea of their arrangement can be obtained in fresh than in preserved specimens. The

color is contained in the gigantic nerve-cells of the centers, some of which are large enough to be visible to the naked eye.

The cerebral ganglion consists of a single triangular mass of nerve-cells, the apex of the triangle being dorsal. The angles of the mass are formed by the principal collections of cells (each of which is a group of loosely aggregated cell masses), while the central portion of the ganglion is less dense. Each buccal ganglion consists of one large, and a dozen or more smaller, cell masses, each quite separate from the others. The broad but short buccal commissure contains no nerve-cells. Each pleural ganglion consists of one large, and several small, cell masses.

Each of the visceral and parietal ganglia contains several cell masses, while similar groups of cells are scattered along the entire length of the left pleuro-visceral connective; therefore, there is a continuous series of ganglionic masses connecting the left pleural and the visceral ganglia.

The pedal ganglia are each composed of more than a dozen small cell masses. While these extend into the pedal commissure, the central part of the latter remains free from them. The pleural commissure contains no nerve-cell masses. The cell masses of the pedal and pleural ganglia are plainly separated.

ILLUSTRATIONS.

PLATE I.

(All drawings on this plate are natural size.)

FIG. 1. *Aclesia freeri* sp. nov.
2. Tentacle of *Aclesia freeri* sp. nov. with large villi.
3. Tentacle of *Aclesia freeri* sp. nov.
4. Large villus of body fully extended.

FIGS. 5 and 6. Villi.

FIG. 7. Rhinophore, showing the posterior grooved surface. (Drawn by Espinosa.)

PLATE II.

FIG. 8. Branchial cavity opened by splitting and folding back the parapodia.
9. Posterior extremity of an expanded, creeping aclesia. (Drawn by Espinosa.)

PLATE III.

FIG. 10. Ventral view of head.
11. Tentacle.
12. Digestive organs of *Aclesia freeri* sp. nov. The liver is drawn as if it were a transparent substance through which the coils of the intestine can be seen. The intestinal artery is seen entering the liver above the right margin of the stomach. The hermaphrodite gland lies back of the liver, surrounded by coils of the intestine.
13. Pharynx, œsophagus, crop, gizzard, and stomach, opened by a dorsal incision.
14. A portion of the wall of the stomach containing the hepatic pore, showing how the aperture is closed by the fleshy lateral pads and the anterior chitinous plate.
15. Lateral view of the pharynx. Only the anterior end of the pharynx is attached to the lips. The left salivary gland lies upon the dorsal surface of the œsophagus; the right some distance below. The buccal ganglia show behind the right salivary gland.
16. Anterior view of the interior of the gizzard.
17. Basal view of a large stomach plate. The axial column is clearly defined. × 2.
18. Lateral view of the same plate. × 2.
19. Lateral view of one of the small plates situated on the anterior margin of the gizzard. × 4.
20. A small spine from the stomach. × 4.5. (Drawn by Espinosa.)

PLATE IV.

FIG. 21. Outline of œsophagus, crop-gizzard, stomach, and hepatic ducts, showing the course of the stomatogastric nerves. × 1.5.

22. The ventral surface of the anterior genital mass. Natural size.

23. The reproductive organs lying in their natural positions. The anterior genital mass lies upon the surface of the liver. Natural size.

24. Outline of the right side of the head of an *Aclesia freeri* sp. nov. showing the everted penis. Natural size.

25. The dorsal surface of the prepuce. × 4.

26. A tentacle having an unusual development of villi.

27. Lateral view of the radula. × 4.

28. Dorsal view of the radula. × 4.

29. Ventral view of the radula. × 4. (Drawn by Espinosa.)

PLATE V.

FIG. 30. Arterial system of *Aclesia freeri* sp. nov.

1, pharyngeal artery.
2, artery of pleuro-pedal ganglion.
3, artery of median portion of foot.
4, artery of right body wall and parapodia.
5, aorta.
6, arteries entering wall of spermatheca.
7, artery of body wall in the region of the seminal furrow.
8, artery of sperm-oviduct and left side of vulva.
9, artery of sperm-oviduct and vulva.
10, artery of sperm-oviduct.
11, osphradial artery.
12, genital artery.
13, artery of hermaphrodite duct.
14, artery of oviduct (albumen gland.)
15, artery of mucous (nidamental) gland.
16, artery of right side of albumen gland.
17, artery of ventral surface of albumen gland.
18 and 19, intestinal artery.
20, hepatic branch.
21 and 23, deep hepatic branches.
22, gastric artery.
24, artery of left side of foot, left body wall, and parapodium.
25, artery of foot.
26 and 27, artery passing along dorsal side of crop and œsophagus.
28, branch to dorsal wall of head.
29, branch to ventral wall of head.

31. The auricle and ventricle in the pericardium. Natural size.

32. The base of the ventricle, to show the large auriculo-ventricular valves, and the arrangement of muscles in the wall of the ventricle. The wall of the auricle is spread out around the base of the ventricle. × 4. (Drawn by Griffin and Espinosa.)

PLATE VI.

FIG. 33. Nervous system of *Aclesia freeri*, sp. nov.

1, nerves to central and inner parts of the pharynx.
2 and 3, nerves to lateral surface of pharynx.
4, nerve to external circular muscle of pharynx.
5, nerve to posterior and ventral surface of pharynx.
6, nerve to lips and anterior part of head.
7, nerve to salivary gland.
8, penial nerve, supplying penis, retractor penis, and the body wall in the vicinity.
9, 10, 11, 12, 14, and 15, nerves passing to body wall, parapodia, and lateral part of foot.
13, the index line is directed to the point where a nerve (24) to the central portion of the foot emerges from beneath the pleural ganglion. Its origin is from the ventral surface of the pedal ganglion.
16, principal pedal nerve.
17, genital ganglion.
18, nerve to sperm-oviduct.
19, small ganglion on ventral surface of sperm oviduct.
20, continuation of trunk of genital nerve.
21, ganglion situated on the rectum, about 7 millimeters from the anus.
22, intestinal nerve.
23, nerve arising from visceral ganglion, which passes to the rectal (anal) ganglion.
24, pedal nerve to central portion of foot.
25, corresponding nerve of left side.
26, nerve traced to spermathęca and pericardial wall.
27, osphradial ganglion.
28, branchial nerve.
29, ganglion situated beside the spermatocyst.
30, ganglion situated at the crossing of the hermaphrodite duct and the oviduct.
30′, nerve to oviduct (albumen gland).
30″, nerve following the hermaphrodite duct to the hermaphrodite gland.
31, nerve to region around the mouth.
32, nerve to oral lobe. The branch on the other side of the fork passes to the integument of the anterior part of the head, dorsal to the mouth.
33, tentacular nerve.
34, main trunk of nerve passing to the oral region.
35, stomatogastric nerve.
36, rhinophoral nerve, ending in ganglion from which numerous fine nerves arise.
37, nerves to anterior portion of foot.
38 and 39, nerves to left body wall and parapodia.
40, left pedal nerve.
cr. b. c, cerebro-buccal connective.
cr. gn, cerebral ganglion.
p. gn. R, right pedal ganglion.

p. c, pedal commissure.
par. gn, parietal ganglion. The right pleural ganglion lies between the pedal and parietal ganglia, closely joined to the latter.
v. gn, visceral ganglion.
p. p. c, para-pedal commissure.
pl. gn. L, left pleural ganglion.
p. gn. L, left pedal ganglion.
cr. pl. c, left cerebro-pleural connective.
cr. p. c, left cerebro-pedal connective.
b. gn, buccal ganglia.

34. Ventral view of pedal, pleural, parietal, and visceral ganglia.
35. Central nervous system of a specimen of *Aclesia freeri* sp. nov. in which the viscero-parietal ganglion is some distance back of the œsophageal nerve ring, approaching the condition found in *Tethys* (*Aplysia*).
c, cerebral ganglion.
p, left pedal ganglion.
p', right pedal ganglion.
pl, left pleural ganglion.
pl', right pleural ganglion.
p. par, pleuro-parietal connective.
pl. v, pleuro-visceral connective.
V. par, viscero-parietal ganglion.
36. Right lateral view of cerebral, pedal, pleural, and parietal ganglia. (Drawn by Griffin.)

TEXT FIGURES.

FIG. 1. Diagram of the pallial complex of *Aclesia freeri* sp. nov. *A*, anal papilla; *bv*, afferent branchial vein; *mr*, mantle ridge, *i. e.*, the projecting free margin of the reduced mantle; *n*, nephridium; *o*, osphradium; *par*, parapodium; *p. c.*, pericardium; *v*, vein of left side of body running beneath the pericardium and nephridium; *vu*, vulva; *x*, aperture by which the blood from the hæmocœl and veins of the right side of the body enters the branchial vein.
2. Outline of a mandibular plate of *Aclesia freeri* sp. nov. The figure within the outline represents four of the rods of which the plate is composed. The concave border of the plate is anterior. Actual dimensions, 5 millimeters high, 3 millimeters wide at bottom, 1 millimeters wide at top.
3. Central tooth, first and second inner laterals, and four outer lateral teeth of the radula of *Aclesia freeri* sp. nov.
4. Cuticular spines or thorns upon the inner surface of the pharynx of *Aclesia freeri* n. sp. The four spines at the left are from the anterior, the ones to the right from the posterior region of the part of the pharynx thus armed.
5. Diagram of the reproductive system of *Aclesia freeri* sp. nov 1, vulva; 2, copulatory recess; 3, spermatocyst; 4, mucous gland (nidamental gland); 5, proximal portion of oviduct; 6, albuminogenous portion of oviduct (albumen gland); 7, hermaphrodite gland; 8, hermaphrodite duct; 9, ovarian portion of sperm-oviduct; 10, spermatic portion of sperm-oviduct; 11, spermatheca.

ACLESIA FREERI sp. nov.

PLATE I.

Fig. 8. Branchial cavity of aclesia.

Fig. 9. Posterior extremity of Aclesia freeri sp. nov.

PLATE II.

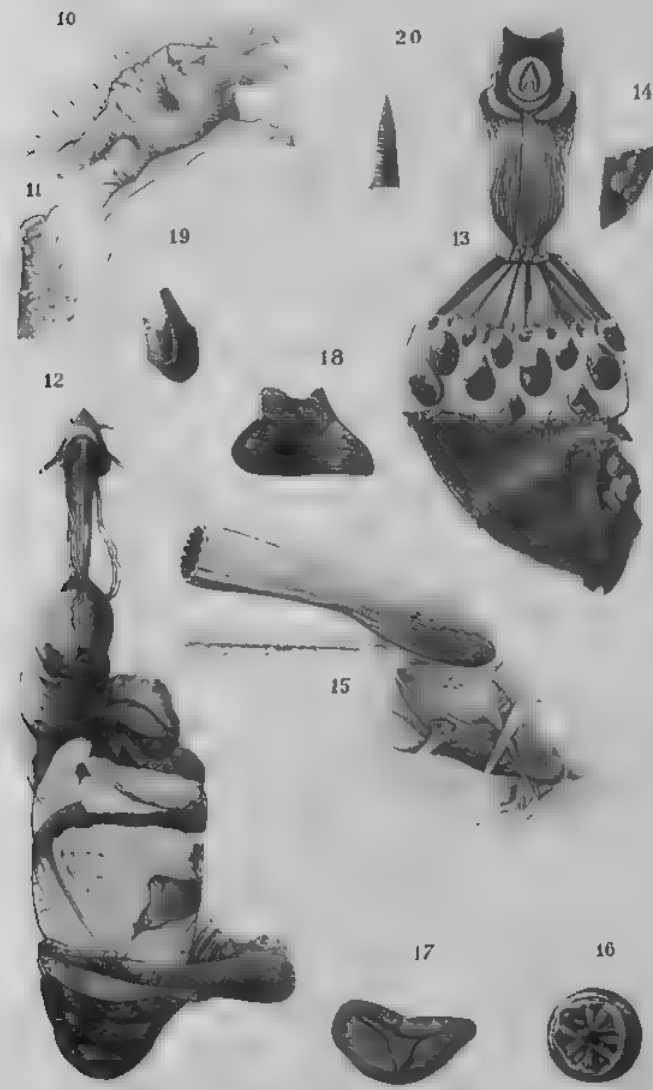

PLATE III. ANATOMY OF ACLESIA FREERI sp. nov.

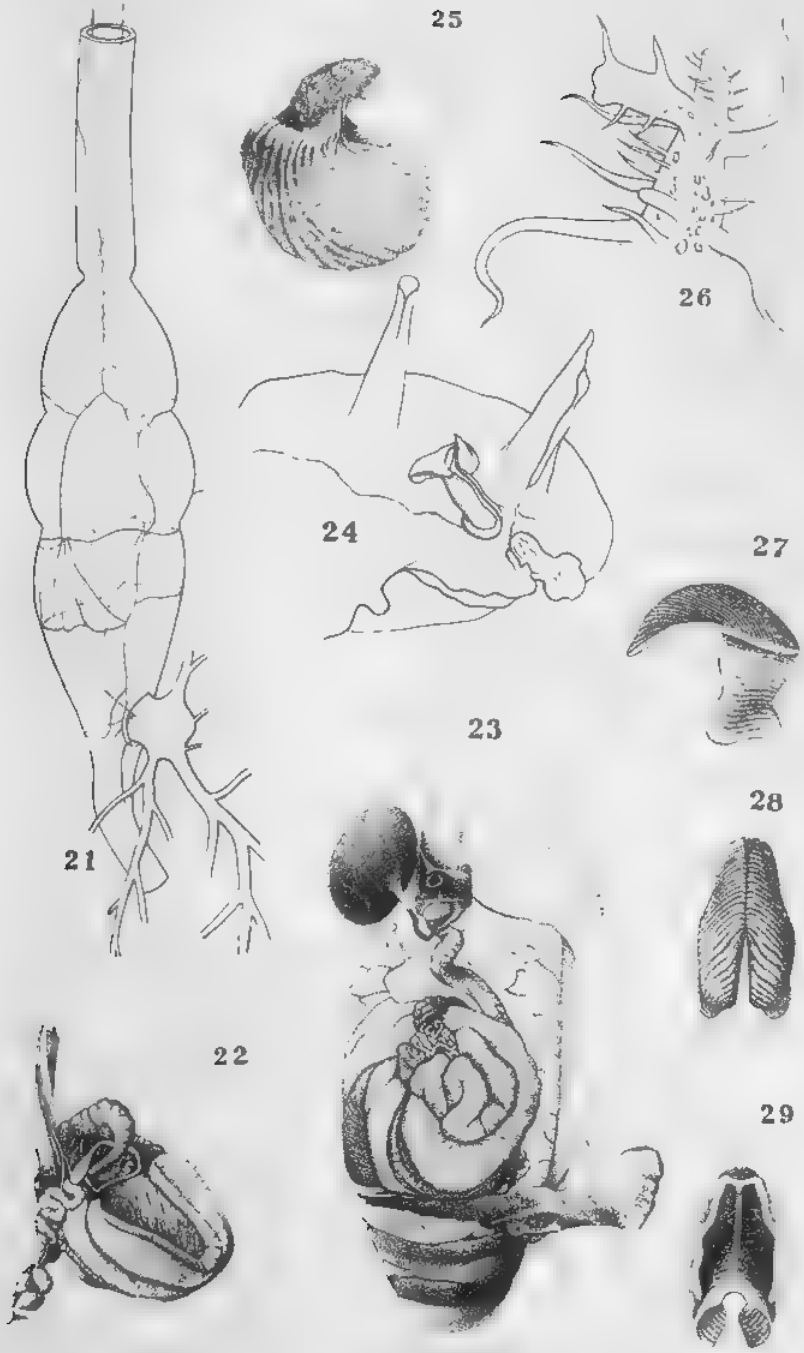

PLATE IV. ANATOMY OF ACLESIA FREERI sp. nov.

PLATE V. ARTERIAL SYSTEM OF ACLESIA FREERI sp. nov

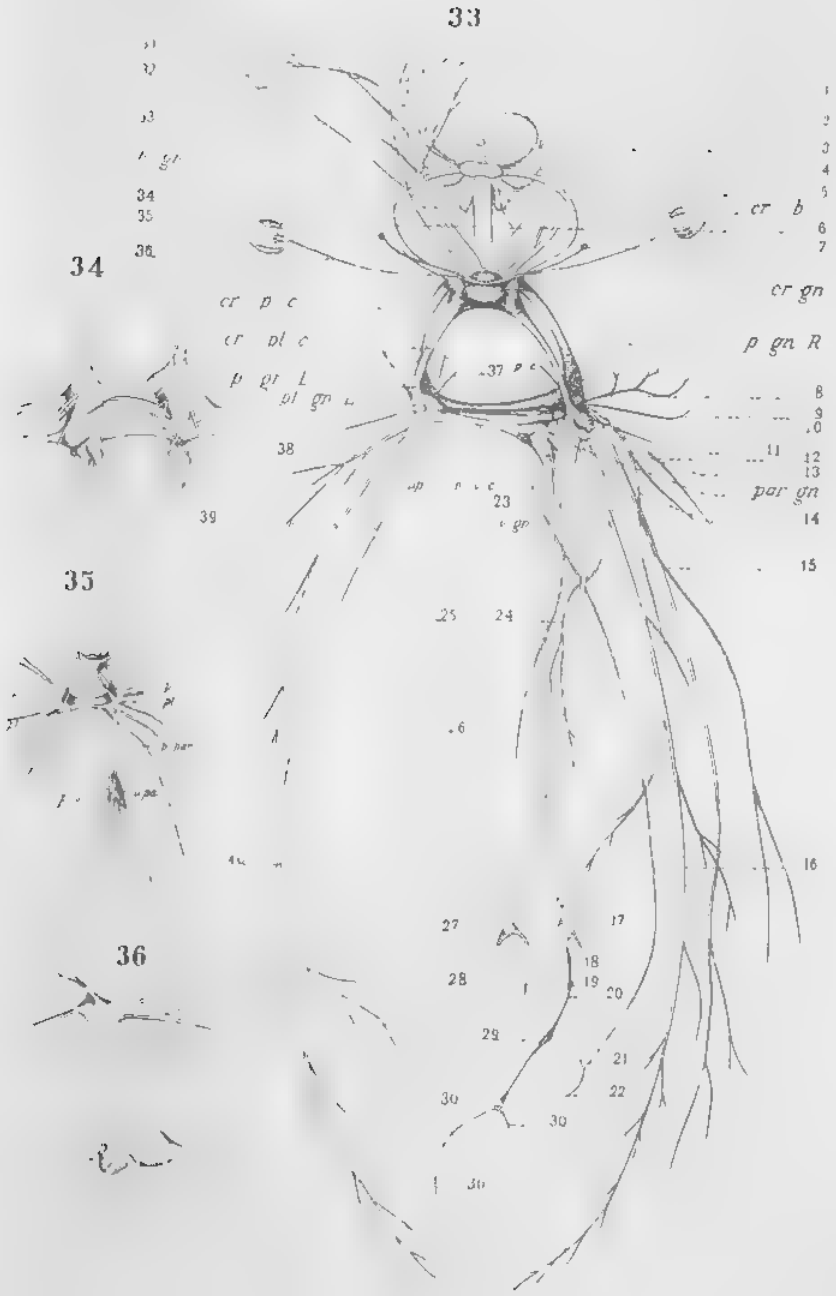

PLATE VI. NERVOUS SYSTEM OF ACLESIA FREERI sp. nov.

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A NEW PHILIPPINE FIDDLER-CRAB.

By A. S. PEARSE.

(*From the Zoölogical Laboratory, University of the Philippines.*)

The most abundant species of fiddler-crab along the *esteros* near Manila has not been described. Believing the species to be new, the writer prepared the following description while he was serving as assistant professor of zoölogy in the University of the Philippines.

Uca rathbunæ sp. nov.

Description.—Length of carapace about three-fifths its greatest breadth, which is at the acute antero-lateral angles. Carapace not very convex, smooth, anterior margin somewhat arcuate; the regions all recognizable, but not clearly defined; posterior border one-half the greatest breadth; lateral margins not converging posteriorly. The crenulate line that bounds the dorsal plane on each side is well marked two-thirds of the way back and convergent posteriorly. The breadth of the front, measured between the bases of the eye-stalks, is about one-twentieth the greatest breadth of the carapace. The front is spatulate, and its raised border is wider at the ventral margin than the central groove.

Orbits somewhat oblique; borders sinuous, both crenulate; crenulations on the lower border progressively larger away from median line; a line of fine crenulations below all the upper border except the outer quarter; a row of tubercles on the floor of the orbit inside the middle third of the lower border.

Larger cheliped of male with hand nearly 3 times greater than length of carapace; merus finely granulated on outer surface, all margins denticulate, denticles larger at superior distal angle; carpus granulated on upper and outer surfaces, hairy

and denticulate on antero-internal margin. Hand with palm somewhat flattened, granulate, both borders well defined, upper border hairy on its compressed rounded posterior margin; oblique granulated ridges on inner surface of palm both well

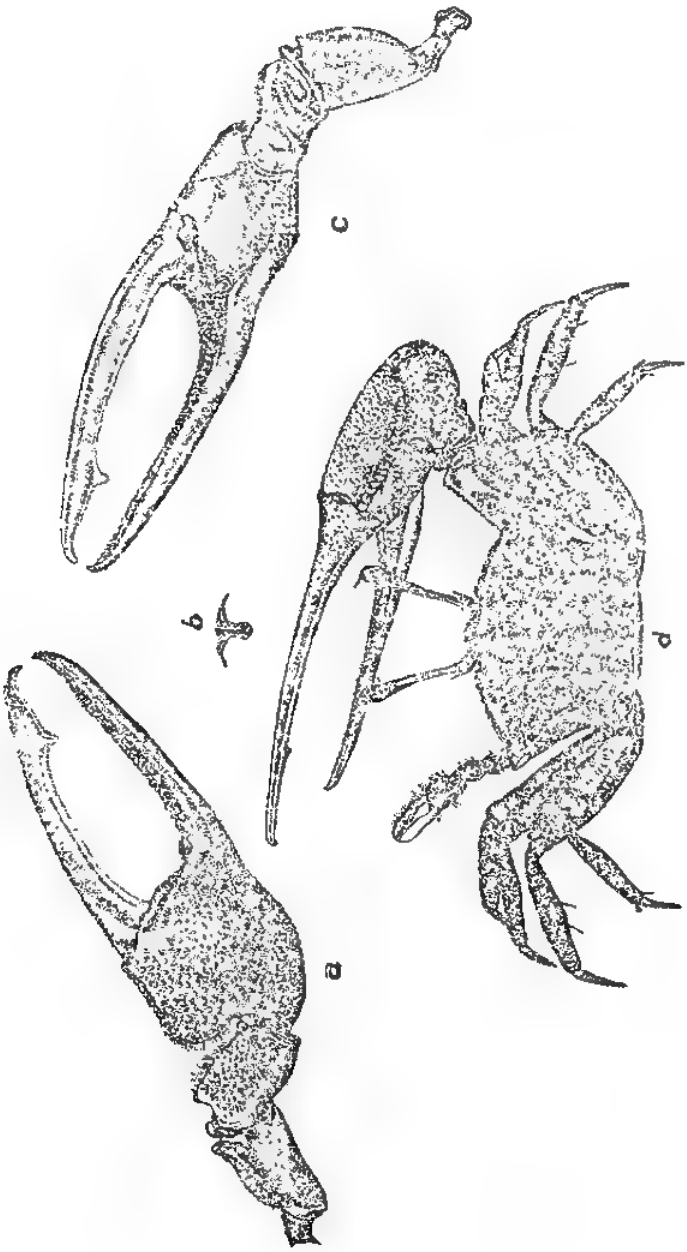

FIG. 1.—*Uca rathbunæ* sp. nov. × 1·5. *a*, Outer surface of cheliped of male; *b*, front; *c*, inner surface of cheliped of male; *d*, dorsal view of male.

defined, outer one most prominent, a well-marked elongated depression between them. Fingers rather slender, strongly flattened, minutely granular; both have a longitudinal groove on the external surface, but that in the fixed finger is the deeper; fixed finger tapering, nearly straight, hooked at the top, smooth on lower margin and denticulate on inner margin; movable finger slightly arcuate, bearing 2 strong spines on inner margin, one at the tip and the other about one-fourth of the length of the inner margin from it; most individuals also have a strong denticle on the inner margins of each of the fingers about one-third of the distance from the proximal end. Merus of last pair of legs somewhat foliaceous.

Color of living male.—Dorsal surface of carapace, dark brown (65)[1] (almost black) with a transverse yellowish-white (141) band back of the front and sometimes another spot of the same color in the center of the back; eye-stalks light brown (137). Large chela with fingers and inside of palm white, outside of palm whitish or green above (341) and fuscous (102) below. Other walking legs gray (222); back of merus of last pair of legs white; abdomen bluish (402).

The above description was taken from 69 males and 8 females, collected May 22, 1911, at an estuary three blocks south of the Philippine Medical School, Manila, P. I. The 10 largest males gave the following average measurements: Length of carapace, 14.64 mm; breadth of carapace, 24.40; length of chela 40.3. This species closely resembles *U. dussumieri* (Milne-Edwards),[2] but can be distinguished from it by the constant presence of a tooth on the inner margin of the movable finger near the tip, by the well-marked lines bounding lateral borders of the dorsal surface, and by the less salient character of the 2 oblique ridges on the inner surface of the palm.

Miss M. J. Rathbun has kindly compared two specimens of this species with specimens of 13 narrow-fronted species from the Indo-Pacific region in the United States National Museum. She reports that *U. rathbunæ* is most nearly related to *U. urvillei* (Milne-Edwards) and makes the following observations:

> Shape of carapace much as in *U. urvillei*. The orbital margin is a little more oblique. Frontal furrow longer, not triangular and sharp pointed at the extremity as in *urvillei*, but slightly spatulate. The accessory line of granules above the lower margin of the orbit is much shorter, occupying

[1] The numbers following colors refer to Klincksieck, P., et Valette, T. Code des couleurs. Paris (1908).

[2] For references, see Alcock, *Jour. Asiat. Soc. Bengal* (1900), 69, 362.

less than one-third of the middle of the orbit, and composed of 4 or 5 granules (or on one side of one specimen it is broken into 8 smaller granules); in *urvillei* the line of granules occupies as much as one-half the length of the orbit. The granulation of wrist and hand is finer than in the related species and the granules on the lower edge of the palm are more prominent. The groove of the immovable finger is more deeply impressed at its origin The fingers are narrower and less flattened; the immovable one has an enlarged tubercle near its middle, and the movable finger has two enlarged tubercles or small teeth, one near the middle and one not far from the tip. The merus joints of the ambulatory legs are not so wide as in *urvillei*, the difference being most noticeable in those of the last pair.

ILLUSTRATION.

TEXT FIGURE.

FIG. 1. *Uca rathbunæ* sp. nov. × 1.5.
a, outer surface of cheliped of male.
b, front.
c, inner surface of cheliped of male
d, dorsal view of male.

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ZWEI NEUE LUCANIDEN DER PHILIPPINEN.

VON CARL FELSCHE.
(*Leipzig, Germany.*)

Prosopocoilus palawanicus sp. nov. (Tafel I, fig. 1.)

♂ Grösse und Statur des *P. buddha* Westw. Schwarz, Kopf matt, Halsschild mässig, Flügeldecken stark glänzend. Kopf fast quadratisch, der Clypeus rund, in der Mitte des Randes mit einem Knoten, die Fläche tief ausgehöhlt, der Stirnkiel bis zum äusseren Rande der Mandibeln reichend, einen nach rückwärts gerundeten mässig tiefen Bogen bildend, Stirn und Scheitel eine ebene, stumpf dreieckige, seitlich unbestimmt begrenzte Fläche bildend, die ganze Oberfläche fein und dicht gekörnt; die Augenkiele wenig hervortretend, das Auge kaum halb durchsetzend, der Seitenrand hinter den Augen etwas gerundet erweitert; die Lippe breit, vorn einen flachen, völlig gleichmässigen Bogen bildend, das Kinn dreieckig, die Unterseite des Kopfes, mit Ausnahme der Kehle welche weitläufig fein punktiert und glänzend ist, dicht und fein gekörnt; die Mandibeln sind etwas länger als Kopf und Halsschild zusammen; unmittelbar an der Basis haben sie einen breit dreieckigen, darüber, etwa am ersten Viertel, einen schlankeren Zahn, von diesem bis zum letzten Viertel sind sie breit, parallelseitig, ganz leicht geschwungen, der letzte Teil ist plötzlich stark verschmälert, sodass der vorhergehende am Ende zahnartig vortritt, der letzte Teil einwärts gebogen in eine starke Gabel endend. Thorax quer ziemlich gewölbt, der Vorderrand in der Mitte vorgezogen, der Hinterrand gerade, die Seitenränder parallel, und im letzten Drittel sehr leicht geschweift, die Vorderecken spitz, unmittelbar neben ihnen eine kleine Ausrandung, die ganze Fläche fein gekörnt, dazwischen sehr zerstreut eingestochene Punkte, die Mitte etwas glänzend. Flügeldecken schwarz, mit sehr schwachem Erzglanz, auf der Scheibe äusserst fein zerstreut punktiert, stark glänzend, die abfallenden Teile seitlich und hinten äusserst fein gerunzelt. Die Beine gleichen denen des *P. buddha*, nur fehlt den Mittelschienen der feine Dorn. Länge incl. der Mand., 49 mm.

PALAWAN, Iwahig, P. I. (*C. M. Weber*).

Typus ♂ in meiner Sammlung unter No. 11631, des Bureau of Science.

Aegus currani sp. nov. (Tafel I, fig. 2.)

♂ Von der Grösse der grössten *A. platyodon* Parry aber schlanker, von diesem wie den anderen mir bekannten *Aegus* durch den Frontalkiel verschieden. Kopf doppelt so breit als lang, parallelseitig; Kopfschild sehr kurz, steil abfallend etwas ausgehöhlt, am Vorderrand sehr leicht geschwungen, der Frontalkiel, welcher bis zur inneren Basis der Mandibeln reicht, ist vierzähnig, die beiden mittleren Zähne gross, mit breiter Basis, durch einen dreieckigen Ausschnitt getrennt, die äusseren kaum ein Viertel so gross; hinter diesem Kiel die Fläche des Kopfes in etwa in ein Viertel ihrer Länge leicht ansteigend, dann eben, dicht gekornt, vorn und an den Seiten mit zerstreuten groben Punkten. Mandibeln so lang als Kopf und Halsschild zusammen, von der Basis an leicht nach aussen, im letzten Drittel ziemlich kräftig nach innen gebogen, die Bezahnung bei beiden gleich; nahe der Basis ein dreieckiger etwas nach unten gerichteter Zahn, darüber, noch etwas unter der Mitte, ein ähnlich grosser, dann, etwa in der Mitte, ein viel kleinerer und endlich im letzten Drittel, gleichmässig verteilt, noch fünf Zähnchen. Halsschild anderthalb mal so breit als lang, hinten und an den Seiten gerade, vorn, wie gewöhnlich geschweift, die hinteren Winkel breit gerundet, die vorderen vorgezogen aber schräg nach innen abgestutzt; die Fläche dicht gekörnt, in der Mitte eine schwache Längsfurche, auf der Fläche einzelne grobe Punkte, besonders in der Furche, an allen Rändern besondere grosse Punkte, die so dicht stehen, dass die Sculptur netzartig erscheint. Flügeldecken jede mit sechs ziemlich tiefen Streifen, die im Grunde kettenartig punktiert sind, die Zwischenräume ziemlich gewölbt fein punktiert, der neben der Naht auf seiner inneren Hälfte ziemlich grob und fein, alle an der Basis sehr grob runzelig punktiert; diese Sculptur erstreckt sich auf dem sechsten Zwischenraum bis ziemlich zur Mitte und tritt auch mehr oder weniger auf die angrenzenden Streifen über; der abfallende Teil der Flügeldecken ist mässig grob, aber sehr dicht punktiert. Die Vorderschienen wie gewöhnlich gezähnt, der vorderste Zahn einfach, die mittleren Schienen mit zwei, die hinteren mit einem Zahn. Länge incl. der Mand., 55 mm.

LUZON, La Laguna, Santa Maria, P. I., (*H. M. Curran*).

Typus ♂ in meiner Sammlung unter No. 12721, des Bureau of Science.

ILLUSTRATIONEN.

Tafel I.

(Ad nat. del J. Castro.)

Fig. 1. *Prosopocoilus palawanicus* sp. nov.
2. *Aegus currani* sp. nov.

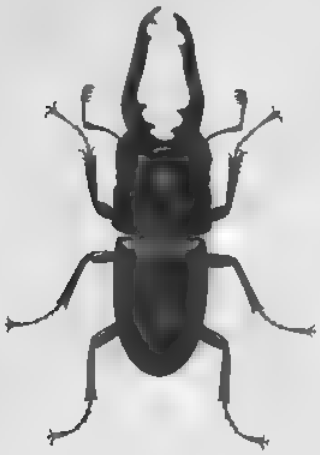

Fig. 1. Prosopocoilus palawenicus sp. nov.

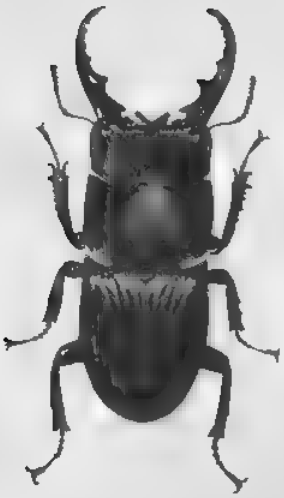

Fig. 2. Aegus curreni sp. nov.

TAFEL I.

THE PHILIPPINE JOURNAL OF SCIENCE.
D. General Biology, Ethnology and Anthropology.
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EIN NEUES APION VON DEN PHILIPPINEN.

VON HANS WAGNER.
(*Dahlem, Berlin, Germany.*)

Apion (Pseudopiezotrachelus) schultzei sp. nov. (Fig. 1.)

Dem *Apion* (*Pseudopiezotrachelus*) *unicolor* Roel. ungemein nahe stehend, durch folgende Punkte von ihm verschieden. Der Rüssel ist in beiden Geschlechtern etwas weniger gekrümmt, beim ♂ wenn auch schwach, so doch deutlich von der Fühlerinsertion zur Spitze verjüngt, beim ♀ kaum schwächer als beim ♂ (bei *unicolor* ♀ fast glatt und ziemlich stark glänzend) sculptiert; der Thorax ist um geringes länger, dessen apicale Einschnürung merklich kräftiger, die Seiten des apicalen Teiles (vor der Einschnürung) erscheinen mehr winkelig und der Vorderrand ist in der Mitte deutlich eingebuchtet; die Punktierung ist etwas gröber und namentlich dichter; die Flügeldecken erscheinen infolge der etwas geringeren seitlichen Rundung ein wenig gestreckter; ihre Zwischenräume sind etwas stärker chagriniert und dazwischen von feinen Querrunzelchen durchzogen. In allen übrigen Punkten stimmt die Art mit *unicolor* völlig überein. Die Art lag mir in 8 völlig übereinstimmenden Exemplaren (♂ ♂ und ♀ ♀) von folgenden Localitäten zur Beschreibung vor:

Länge, incl. Rüssel, 3 mm.

LUZON, Batan, Lamao (*H. E. Stevens*).

Typus, ♂ und ♀ No. 9841 in der Sammlung des Bureau of Science, Manila, P. I.

LUZON, Pampanga, Mt. Arayat (*W. Williamson*).

Cotypen, No. 2986; 4 Exemplare, davon 2 Exemplare mir freundlichst überlassen.

In dem Material, welches mir von Herrn W. Schultze in Manila, dem die vorstehende Art freundlichst dediciert sei, mitgeteilt wurde, befanden sich noch 4 Exemplare des *Apion versutum* Faust, die sich—nach Vergleich mit der Type—nur durch etwas helleres Braun des ganzen Körpers und durch die helleren,

mehr rötlichgelbbraunen Beine von der typischen Form unterscheiden; sämmtliche Exemplare stammen von Manila, Luzon (*C. S. Banks* No. 5275; und *B. Arce*, No. 6150), ein Belegexemplar wurde gleichfalls freundlichst meiner Collection überlassen.

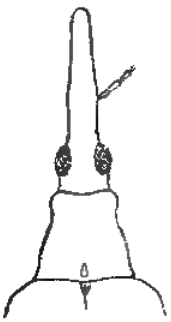

Fig. 1.—Kopf und Thorax von *Apion schultzei* sp nov.

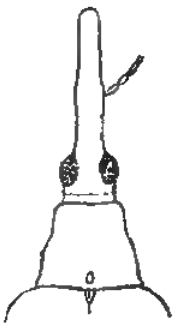

Fig. 2.—Kopf und Thorax von *Apion unicolor* Roel.

Der leichteren Orientierung wegen habe ich es für gut befunden die Characterisierung der vorstehenden neuen Art mit einer mittels des Abbé'schen Zeichenapparates angefertigten Skizze der in Betracht kommenden Körperteile zu vervollständigen und habe zum Vergleich dazu auch eine solche über *Apion* (*Pseudopiezotrachelus*) *unicolor* Roel. (Fig. 2) beigegeben; beide Abbildungen beziehen sich auf das männliche Geschlecht der betreffenden Species.

ILLUSTRATIONEN.

TEXTFIGUREN.

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EINE NEUE GATTUNG DER DISCOLOMIDAE (COLEOPTERA) AUS DER ORIENTALISCHEN REGION.

Von K. M. HELLER.

(*Kgl. Zoologisches und Anthropologisch-Ethnographisches Museum, Dresden, Germany.*)

Nachdem D. Sharp[1] gezeigt hat, dass die kugeligen kleinen Hinterhüften seiner Discolominen-Subfamilie nur die sichtbaren Enden von in Wirklichkeit sehr breiten, aber vom Metasternum und von der ersten Bauchschiene verdeckten queren Hüften sind, macht es Hugh Scott[2] sehr wahrscheinlich, dass auch die Gattungen *Aphanocephalus* und *Fallia* zu den bereits von Horn[3] als Familie vorgeschlagenen Discolomidae gehören, was E. Csiki[4] als bereits erwiesen annimmt und dementsprechend 8 Discolomiden Gattungen aufführt, darunter auch *Aphanocephalus*. Letztere war bisher die einzige Gattung der Familie, die ausser in der neotropischen auch in der orientalischen Region verbreitet ist. Es ist daher eine überraschende Tatsache, dass mir durch die Sammlung des Bureau of Science in Manila noch eine weitere, neue Gattung, die jedoch eine nähere Verwandtschaft mit *Holophygus* als mit *Aphanocephalus* aufweist, bekannt geworden ist und weiter unten ausführlicher beschrieben werden kann; sie lässt sich nach den zumeist nur den Diagnosen entnommenen Gattungsmerkmalen der Discolomidae (mit Aus-

[1] Biol. Centr. Americana, Coleop. (1899), 2, pt. 1, 497.
[2] Fauna Hawaiensis (1908), 3, pt. 5, 432.
[3] *Proc. Am. Phil. Soc.* (1878), 17, 556.
[4] Coleopterorum Catalogus. Berlin (1910), pars 18, 31.

nahme von *Coccidophilus*) wie folgt in einer tabellarischen Übersicht der Gattungen einreihen:

A^1. Tarsen viergliedrig, Körper länger als breit, 9–11 Fühlerglied eine lose gegliederte Keule bildend.

Discogenia Kolbe. Ostafrika.

A^2. Tarsen dreigliedrig.

B^1. Seitenrand der Decken nicht, oder wenn abgesetzt, dann weder wellenförmig noch mit einer Reihe entfernter Knötchen.

C^1. Fühlergeissel neungliedrig, Körper fast kreisrund oder kurz elliptisch, Flügeldecken ohne abgesetzten Seitenrand.

Diseoloma Er. Central- und Südamerika.

C^2. Fühlergeissel 7–8 gliedrig, Körper gestreckt, elliptisch, Hinterhüften weit voneinander getrennt.

X^1. Keule ungegliedert, 4. und 5. Geisselglied an Länge wenig verschieden (die 3 letzten Geisselglieder zusammen viel länger als das vierte Geisselglied). Hinterhüften klein, kugelig.

Fallia Sharp. Hawai, Central Amerika.

X^2. Keule zweigliedrig, 4. und 5. Geisselglied an Länge sehr verschieden (die 3 letzten Geisselglieder zusammen nur so lang wie das vierte). Hinterhüften quer bis an die Hinterbrustepisternen reichend.

Coccidophilus Brèthes. Argentinien.

C^2. Fühlergeissel achtgliedrig. Körper fast kreisrund, Flügeldeckenseitenrand schmal abgesetzt, Halsschild an der Wurzel am breitesten, Geissel relative dünn (Keule ungefähr viermal so dick wie das letzte Geisselglied)

Aphanocephalus Woll. Hinterindien, China, Japan, Brasilien.

B^2. Seitenrand der Decken breit abgesetzt, wellenförmig, mit einer Reihe von ungefähr sechs entfernten, knötchenartigen Anschwellungen

D^1. Fühlergeissel achtgliedrig, Halsschild nahe der Mitte am breitesten, nach vorn mehr als nach hinten verengt, Fühlerkeule kurz keulenförmig, nur doppelt so breit wie das letzte Geisselglied, Schenkel gezähnt.

Parmaschema gen. nov. Philippinen.

D^2. Fühlergeissel achtgliedrig, Halsschildseitenrand nicht wellenförmig.

E^1. Halsschild in der Mitte am breitesten, Fühlerkeule kurz keulenförmig.

Notiophygus Gory. Südafrika.

E^2. Halsschild an der Wurzel am breitesten, Keule birnförmig, Hinterhüfte weit getrennt.

Cassidoloma Kolbe. Ost und Westafrika.

D^2. Fühlergeissel neungliedrig, Halsschildseitenrand wellenförmig, Fühlerkeule gestreckt keulenförmig.

Holophygus Sharp. Centralamerika.

Die neue Gattung sei wie folgt charakterisiert:

PARMASCHEMA gen. nov.

Genere *Holophygo* Sharp similis, sed antennae octoarticulatae, articulo ultimo breviter clavato haud articulato; prothorax transversus, lateribus fortiter rotundatis haud undulatis; femora ante

apicem subter minute dentata; mesosternum inter coxas intermedias haud productum.

Typus: *Parmaschema nodimargo* sp. nov.

Köperform einer kleinen *Cassida* ähnlich. Geflügelt. Kopf mit querem, gewölbtem, von der Stirn durch eine gerade Naht getrenntem, am Vorderrand leicht ausgebuchtetem, Epistom. Lippentaster zweigliedrig (?), das vorletzte Glied aufgeblasen und gekrümmt, viel grösser als das konische letzte. Kiefertaster dreigliedrig, das zweite Glied quer, das dritte gestreckt kegelförmig. Fühler vor den vorstehenden Augen unter dem Seitenrand des Kopfes eingefügt, 8-gliedrig; das Endglied breit, keulenförmig angegliedert. Halsschild quer, am Hinterrande beiderseits leicht gebuchtet. Schildchen dreieckig, sehr klein. Flügeldecken breiter als das Halsschild mit flach ausgebreitetem Seitenrande. Hinterleib sechsringelig, erstes Bauchsternit so lang wie die beiden folgenden zusammen, mit kurzem zwischen die Hinterhüften hineinragendem Fortsatz. Alle Hüften scheinbar klein, kugelig und einander genähert. Tarsen dreigliedrig, das dritte Glied mindestens so lang wie die ersten zwei Glieder zusammengenommen.

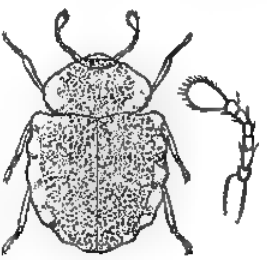

FIG. 1.—*Parmaschema nodimargo* gen. et sp. nov.

Parmaschema nodimargo sp. nov.

Badius, crebre punctatus, subtilissius parceque pilosus, elytrorum thoracisque margine pallidiore, subpellucido ac subtilius punctato, corpore subter, antennis pedibusque testaceis; prothorace transverso, margine laterali deplanato ac rotundato, maxima latitudine basi propiore, in dimidia parte basali crenulato, margine antico sinuato basi utrinque subsinuato; elytris margine basali utrinque intra humeros subsinuato, angulis humeralibus subrecte rotundatis ac extantibus, margine laterali expanso, undulato, nodulis sex glabriusculis remote seriatis apicem versus decrescentibus; metasterno segmentoque abdominali primo sat remote fortiterque punctatis, segmentis reliquis medium versus parcius punctatis; epipleuris in nodulis singulis obsoletis puncto majore.

Long. 1.8, lat. hum. 1.5 mm.

Patria: LUZON, Laguna, Lazaan (legit *Charles S. Banks*). Typus No. 11488 in Coll. Ent., Bureau of Science, Manila, P. I.

Kastanienbraun, überall sehr fein und sparsam behaart; Kór-

perunterseite, Epistom, Fühler, Beine, der ausgebreitete Rand des Halsschildes und der Flügeldecken heller.

Epistom doppelt so breit wie lang, bräunlich gelb, etwas glänzend, fein und zerstreut punktiert, Stirn dunkler, relativ grob und dicht punktiert. Zweites Glied der Fühlergeissel fast kugelig, das dritte länger als eines der übrigen, Keule so lang wie die drei vorhergehenden Glieder zusammen, $1\frac{1}{2}$ mal so lang wie breit. Halsschild doppelt so lang wie breit, der Seitenrand breit abgesetzt und flach, etwas durchscheinend und fein, die Halsschildscheibe gewölbt und grob punktiert, Basalrand beiderseits, der Vorderrand einfach ausgebuchtet, Seitenrand in der Basalhälfte stark gerundet und fein gezähnelt, in der Apicalhalfte kaum merklich concav verlaufend, in der Mitte der Ausschweifung mit zwei mikroskopisch kleinen Einkerbungen, Hinterecken sehr stumpf, Vorderecken rechtwinkelig verrundet. Flügeldecken so lang wie breit, Basal- und der wellenförmige Seitenrand in der Hauptrichtung rechtwinkelig aufeinanderstossend, ersterer vor den vorstehenden, abgerundeten Schulterecken etwas ausgebuchtet, mit Ausnahme des Seitenrandes grob und noch dichter als das Halsschild punktiert, jener mit einer Reihe von 6 nach hinten zu kleiner werdenden rundlichen, glänzenden, Schwielen, die grösser als die sie trennenden Zwischenräume sind; auf den breit umgeschlagenen Seitenrand (den Epipleuren) sind diese Schwielen wenig angedeutet und nur durch einen grösseren Porenpunkt markiert. Körperunterseite; namentlich die Hinterbrust und das erste Bauchsegment mässig dicht und kräftig, die übrigen Bauchsegmente nur an den Seiten deutlich punktiert. Äussere Kante an der Unterseite der Schenkel vor der Spitze in Form eines stumpfen kleinen Zahnes ausgezogen. Drittes Tarsenglied viel länger als die beiden Wurzelglieder zusammengenommen.

Die interessante Art wurde in fünf Exemplaren von Herrn Charles S. Banks, Government Entomologist in Manila, im mittleren Teil von Luzon, in Laguna, entdeckt.

ILLUSTRATIONEN.

Textfiguren.

REVIEW.

Biology. General and Medical. By Joseph McFarland, M. D., with 160 illustrations. Pp. 440. Cloth. Philadelphia and London, W. B. Saunders Company, 1910.

Many teachers of biology should have welcomed the appearance of McFarland's book. It presents many subjects to which it has been difficult to introduce students without requiring them to read a large amount of extremely technical literature. It appears possible to use this book as a text in connection with laboratory work and lectures. If this is done the content of courses in general biology can be very considerably increased, and the student will come in contact with a much wider range of biological facts than is usually attempted in the so-called courses in general biology. The reading of this text, however, has emphasized the belief, which the reviewer has held for many years, namely, that courses in general biology should not be given to elementary students, but should follow one or more college courses in zoölogy and botany. To introduce students to phenomena of living substance through a course in general biology is fascinating in theory, but discouraging in practice. This text of McFarland, while evidently intended for use by students who have not had extensive scientific training, can scarcely be employed to advantage by those who have not had thorough preliminary courses in zoölogy and botany.

The scope of the work is wide, touching in its 18 chapters on such subjects as "Cosmical Relations of Living Matter," "the Origin of Life," "Conformity to Type," "Blood Relationship," "Parasitism," "Infection and Immunity," etc. It is significant of the increasing requirements of medical education, that medical students should be expected to have such a general knowledge of biological facts and theories as is outlined in this book. While there are chapters which will not meet with the full approval of zoölogists, still they may well read it carefully for the sake of seeing many things in their own field from a new point of view. The résumé of the theory of spontaneous

generation is usually clear and good. The chapter on Manifestations of Life includes a discussion of the responses of animals and plants to various stimuli which is for the most part correct and clear. It might have been better to have made more manifest the distinction between nerve force and electricity. The paragraph in which distinction between motion and locomotion is set forth, while not important in itself, is one which illustrates the author's faculty of clear and illuminating expression. The section on metabolism is very good, especially its treatment of "foods" and the integration of living substance. It is unfortunate that in a book of this general character, cell division has not been treated in a broader manner.

The chapter on the higher organisms is probably the one most open to criticism by zoologists. However, it should be remembered that a discussion of animal morphology, limited to 60 pages, is more difficult to write than a text-book of several times that length. The chapter on parasitism will be found extremely useful, and, if properly used in conjunction with laboratory work, should give the student a thorough grasp of this difficult but fascinating subject. The discussion of blood relationship is not as extensive as one would expect to find, but is sufficient if properly supplemented by the teacher. The chapter on infection and immunity affords a discussion of this subject which should go far to prepare students who are expecting to study medicine to understand this work in bacteriology and pathology, and give the work in bacteriology more biological meaning than is frequently the case. The text is not one which can be used to advantage, with even a fairly advanced class, unless the teacher is prepared to supplement it very largely with both lectures and experimental work and with additional readings; but, if used in the right way, it should prove a distinct advance on the texts in general biology which are now available.

LAWRENCE E. GRIFFIN.

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